The Government Bond Market: Fiscal and Monetary Policy Linkages

July 2002

Sigma One Corporation

The Government Bond Market: Fiscal and Monetary Policy Linkages

Submitted to:

U.S. Agency for International Development
Mission to Ghana

for:

Trade and Investment Reform Program (TIRP)
Improved Policy Reform and Financial Intermediation
USAID Contract Number: 641-C-00-98-00229

by:

Curtis Youngblood
A. Fritz Gockel
Mahamudu Bawumia
Sigma One Corporation

In fulfillment of the following milestones:

3.12 A brief on public debt management for private sector growth

July 2002 **Sigma One Corporation**

THE GOVERNMENT BOND MARKET: FISCAL AND MONETARY POLICY LINKAGES

Prepared by:

Dr. Curtis Youngblood
Dr. A. Fritz Gockel
Dr. Mahamudu Bawumia

Paper Presented at
National Workshop on Debt Markets for the Golden Age of Business
July 5-6, 2002

Trade and Investment Reform Program
Improved Policy Reform and Financial Intermediation
USAID Contract No. 641-C-00-98-00229

In fulfillment of Milestone 3.12

THE GOVERNMENT BOND MARKET: FISCAL AND MONETARY POLICY LINKAGES

During the 1990s, the share of short-term financial instruments (91- and 182-day Treasury bills) in the domestic public sector debt fluctuated between 40 and 100 percent (**Fig. 1**). In the early 1990s, the share of short-term (ST) instruments fell sharply from 80 to 40 percent as significant reductions in the rate of inflation occurred. As inflation began increasing in 1993 and accelerated to 70 percent per year in 1995, the share of ST instruments climbed to more than 80 percent.

Then, as inflation fell sharply in 1996 and 1997, an unsettling pattern emerged—the share of ST instruments remained stable. Rather than falling with inflation as it had in the past, holdings of ST debt instruments remained around 80 percent. Even more surprisingly, as inflation continued to fall during 1998 and the first half of 1999, the share *increased* sharply to 98 percent of the total. This sudden shift occurred well before the severe exchange rate depreciation in the last quarter of 1999, which led to a resurgence in inflation in 2000.

Changes in the maturity profile of the debt were seemingly driven by inflation during the first half of the 1990s: the share of ST instruments fell as inflation declined and rose as inflation increased. The question arises as to why the share of 91- and 182-day T-bills did not decrease again as inflation fell during the latter part of the 1990s, and, in particular, what precipitated the rapid switch to holding only ST financial instruments? To answer this question we looked at the real returns to following two alternative investment strategies, a short-term strategy of holding 91-day T-bills and a "long-term" strategy of holding 1-year Treasury notes.[1]

The Advantages of a Short-Term Outlook

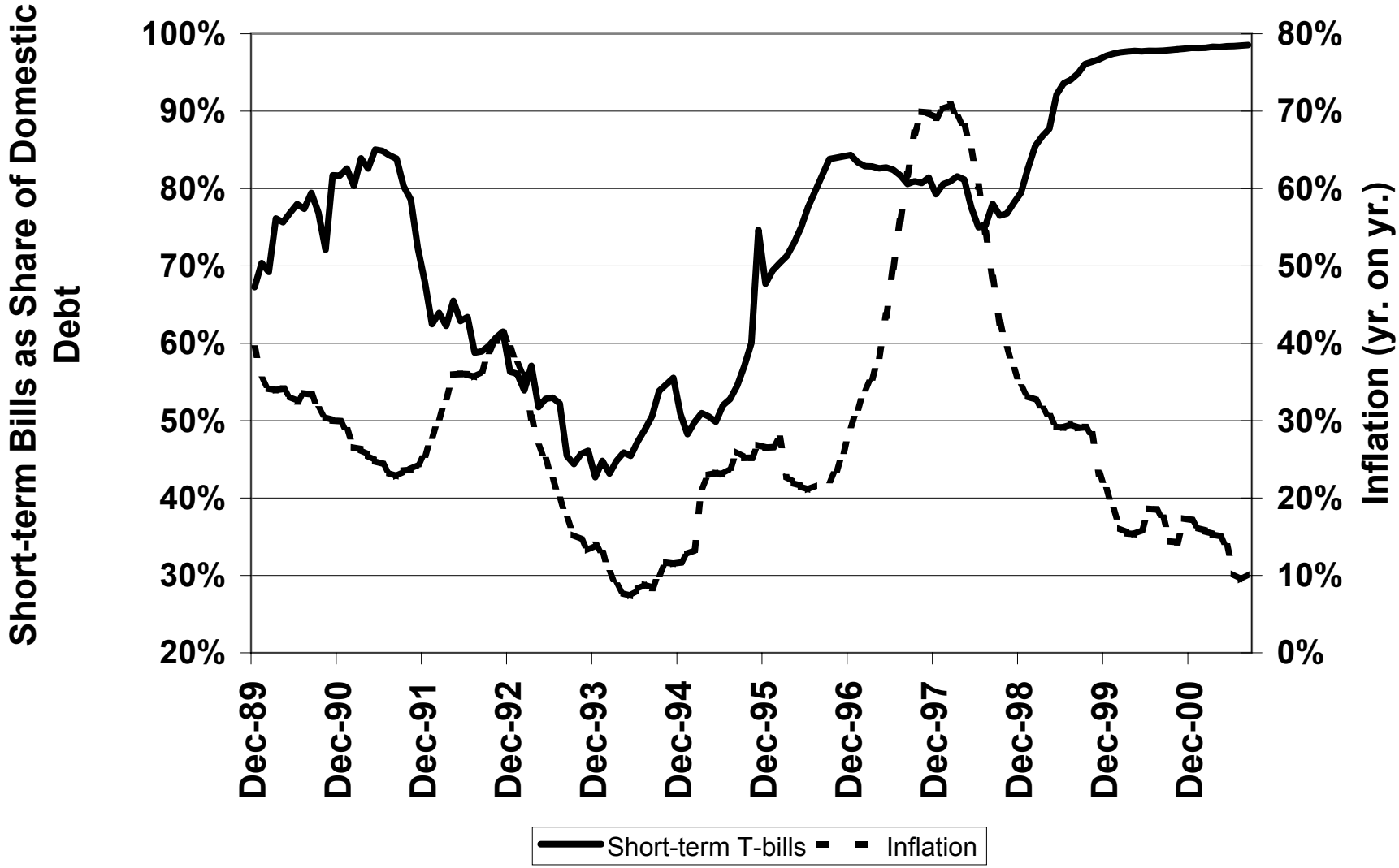
In the long-term holding strategy, the investor buys a 1 year Treasury note when it is issued and holds it until it matures. We assume that the note is purchased at a discount from its face value. At the end of the year, the investor receives the face value of the note; his nominal return is the percentage difference between the face value and the discounted value. We adjust this nominal return for the inflation that has occurred over the 12 months during which the investor holds the note.[2] This gives the real return to this strategy. We applied this procedure for rolling 12 month periods for each month in the January 1997-June 2001 period: e.g., January-December, February-January, March-February, etc. This gives us a sequence of annual real returns for each month of this period.

---

[1] Interest rates for 1-year notes were available throughout the period of interest. Interest rates on 2 year Treasury bonds were not reported after October 1998. Bank of Ghana data show a sharp drop in the outstanding value of 2 year bonds between August and October 2000, indicating that they were no longer issued, or were issued only in very small amounts from October 1998 onward.

[2] This real return is actually calculated by $i_r = \frac{1+i}{1+\pi}$ where i is the nominal return and π is the year-on-year inflation rate. This more accurately captures the real return when interest rates and inflation rates are high than does the usual shortcut of calculating the real return as $i - \pi$.

Fig. 1. Share of Short-Term Instruments and the Inflation Rate



An alternative strategy is for the investor to buy a 91-day T-bill when it is issued and reinvest all of the proceeds in another 91-day T- bill when the first one matures. This process is repeated four times over the course of a year. For example, the investor who first purchases a 91-day T-bill at the beginning of January, would have investment periods corresponding to January-March, April-June, July-September, and October-December. For the investor who starts at the beginning of February, the investment periods would be February-April, May-July, August-October, and November-January. We assume that all of the proceeds of each quarterly investment cycle are reinvested in new 91-day T-bills. At the end of the year, we adjust the nominal value of the proceeds accumulated over the year to remove the effects of inflation over the same period. As with the strategy involving 1 year Treasury notes, we applied this procedure for rolling 12 month periods and derived a sequence of annualized real returns for each month of the January 1997-June 2001 period.

The sequence of real returns from these two strategies is plotted in **Figure 2**. The dates on the horizontal axis refer to the months in which the investor initially purchased the instrument; the real return reported for that date is the return realized 12 months later. For example, the real returns to buying 1 year T-notes and 91-day T-bills in January 1997 that were realized in December 1997 were 23 and 35 percent, respectively; these points are shown above the January 1997 date.[3]

The returns to the long-term investing strategy are persistently and significantly below the returns to the short-term strategy. The returns to the long-term strategy also turn negative and remain so for over a year—the nominal interest rate on 1 year notes was below the rate of inflation during this time. This answers the question of why the share of ST instruments did not fall again as inflation declined during the latter part of the 1990s. The expected returns to the short-term strategy were simply too lucrative.

This point is highlighted by considering the relative returns of the two strategies. The relative return is calculated by subtracting the return from holding 1 year T-notes from the ST return (**Figure 3**). The advantage of investing in short-term instruments is clear: *lately this strategy has yielded between 15 to 20 percentage points more in real terms than the strategy of holding a longer-term instrument.* This difference in relative real returns presents a formidable obstacle to increasing the share of longer term instruments in the public sector debt.

Furthermore, the size and persistence of the additional returns to short-term investing have created a powerful expectation that they will continue. Over the 54 months of the period, an investor would have been mistaken in choosing the ST strategy in only 3 months—just over 5% of the time. In other words, in the choice between short-term and long-term investing, an investor had a 95% chance of picking the winning strategy.

[3] We could have used a different dating system, in which the date refers to the time the returns are realized. In the example above, we would have used December 1997 instead of January 1997. The results shown in the graph would not change—only the dates assigned to them. Our choice of assigning dates to the real returns assumes that the investor can accurately predict inflation over the coming year. This is the assumption of perfect foresight, which is used in constructing rational expectations economic models with no uncertainty.

Fig. 2. Real Returns to Short- and Long-Term Investing

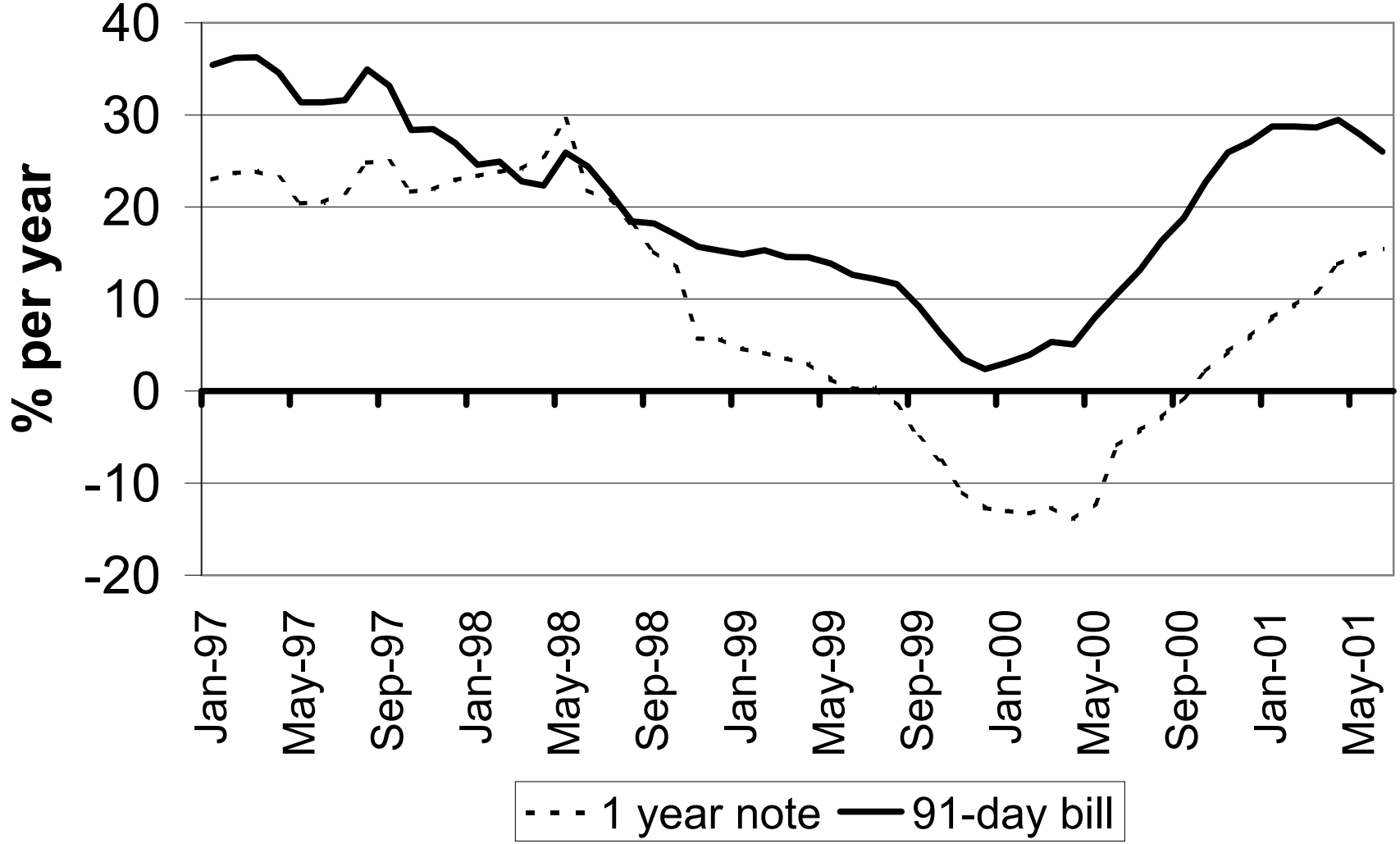
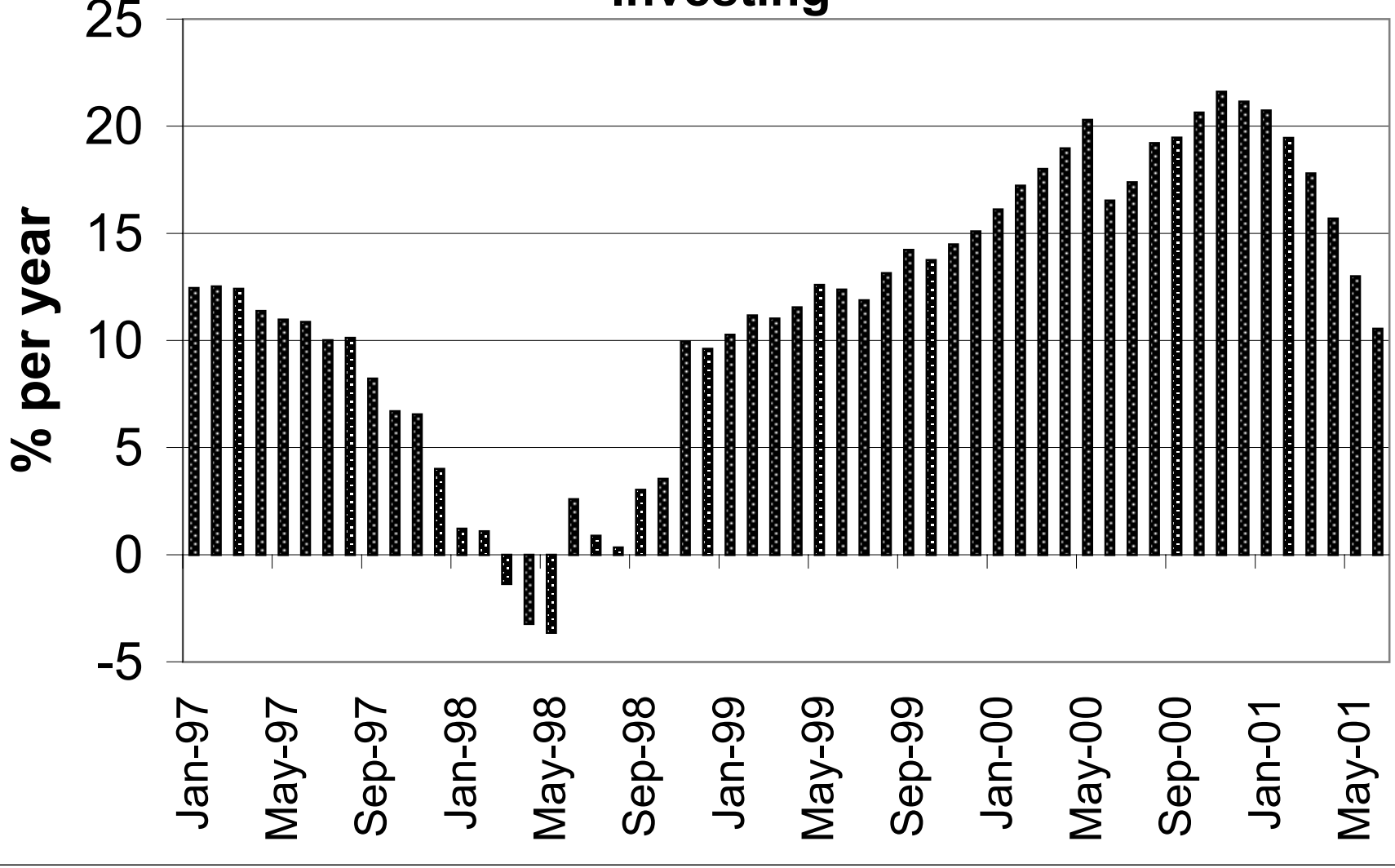


Fig. 3. The Additional Return to Short-Term Investing



One important aspect of the return to these alternative strategies that we have ignored is the notion of interest-rate risk. This risk arises because of the negative relationship between interest rates and the prices of debt instruments. After a bond is issued at a given interest rate, an increase in the market interest rate will lower the price of the existing security in order to equilibrate the return between existing and newly issued instruments. The increase in interest rates results in a potential capital loss on existing securities. The longer the time until maturity, the greater this capital loss becomes (**Table 1**). It is possible for the capital loss to offset the interest yield so that the rate of return on holding the longer-term instruments becomes negative.

Table 1. One-Year Returns on Different-Maturity 10% Coupon Rate Bonds When Interest Rates Rise from 10% to 20% at the End of the First Year

(1) Years to Maturity When Bond is Purchased	(2) Initial Current Yield (%)	(3) Initial Price ('000 C)	(4) Price Next Year ('000 C)	(5) Rate of Capital Gain (%)	(6) Rate of Return (2 + 5) (%)
5	10	1000	741	-25.9	-15.9
3	10	1000	847	-15.3	-5.3
2	10	1000	917	-8.3	+1.7
1	10	1000	1000	0.0	+10.0

Source: 1, 2, and 5 year results from F. S. Mishkin, *The Economics of Money, Banking, and Financial Markets*, 6th edition, Addison-Wesley: Boston, 2001, p. 84. Results for 3-year maturity calculated.

In the example we discussed above, where both instruments (91-day T bills and 1-year T notes) are essentially short-term, and we are considering only 1-year holding periods, there would be no interest-rate risk. (Note that the rate of capital gain is zero for the 1-year instrument, so that the rate of return is equal to the initial current yield.) But in a secondary market in which instruments with maturities of 3 and 5 years are traded, changes in interest rates cause changes in the capital value that become an important part of the rate of return realized on these instruments. This consideration would make the prospective returns to short-term investing even more pronounced, particularly when the economic environment is uncertain or unstable.

Inflationary Outlook and Prospects for Future Interest Rate Increases

The above discussion raises the question, how likely are substantial increases in interest rates in the future? How one answers this question depends partly on one's expectations for future inflation. If these expectations were based only on the past (i.e., ignoring the potential effects of current government policies), then one would have to conclude that inflation in the future is likely to be significantly higher than it is now and that therefore interest rates will also be higher in the future. Over the past 15 years the median rate of inflation has been 26%.[4] This means that half the time inflation was higher than 26% per year. The current inflation rate is 14%. Based

[4] Point-to-point inflation rates were calculated on a monthly basis for the period October 1987-May 2002.

solely on the historical experience reported in **Table 2**, the likelihood of this event is about 19%, which means that the likelihood that inflation could be higher than this is more than 80%.

High and variable rates of inflation are monetary phenomena, however, not merely the continuation of past trends. Ghana's high inflation has been a result, either direct or indirect, of the need to finance persistent and large fiscal deficits. Thus, whether future inflation is a continuation of past trends or whether there is a credible break with the past to a permanently lower rate of inflation rests squarely in the hands of the government. If the government demonstrates a credible commitment to bringing its expenditures more in line with its revenues and is able to carry out this commitment through the next election cycle, an important step in lowering inflationary expectations would have been taken.

Table 2. Distribution of Inflation Rates, October 1987-May 2002

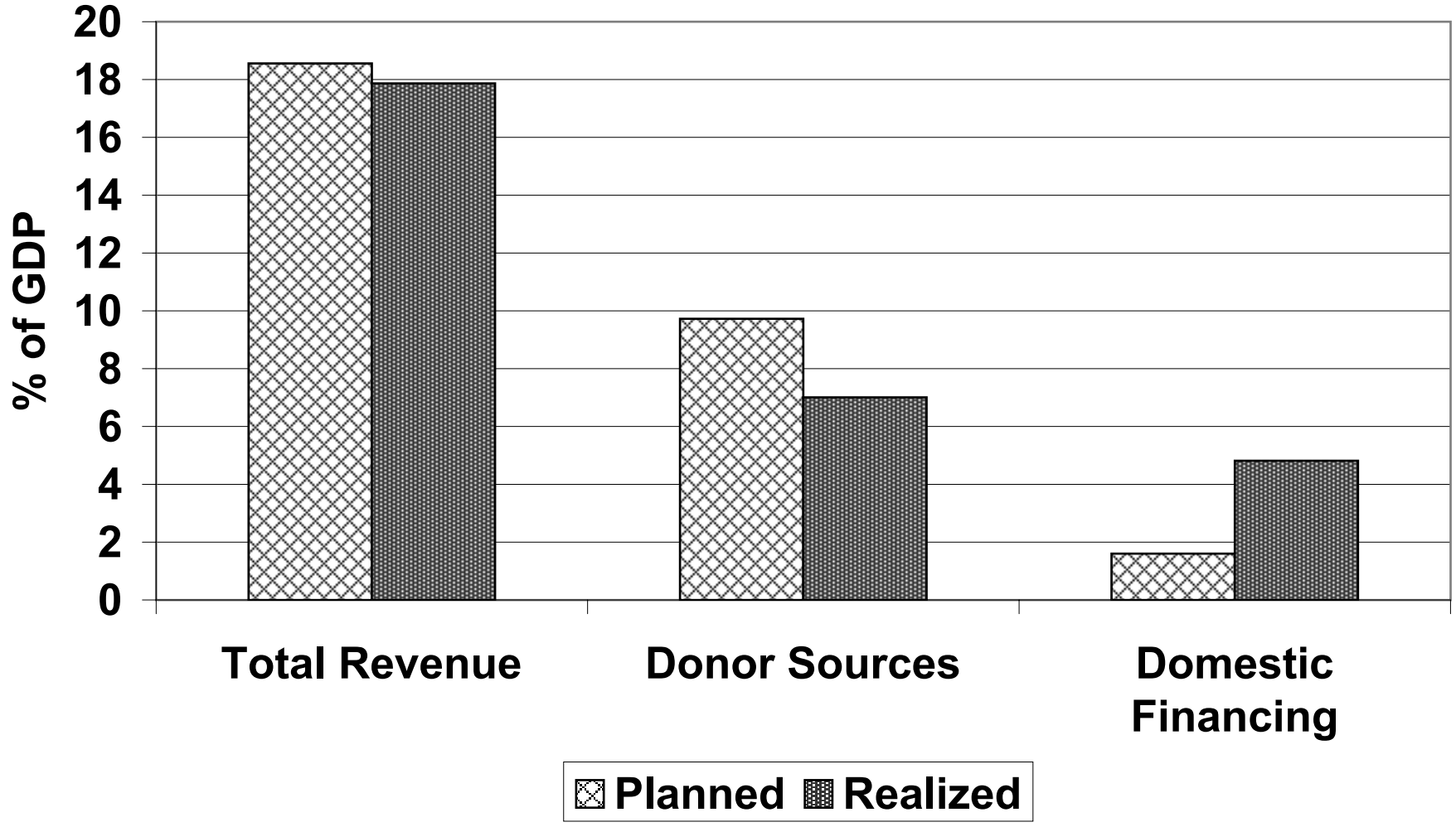
Inflation Rate (% per year)	Frequency (% of time rate falls in given range)
Less than 15%	18.8
15%-25%	29.0
25%-35%	27.8
35%-45%	15.9
Greater than 45%	8.5

The government is always well-intentioned in this regard. The budgets presented to Parliament each year typically propose a small deficit—small as a percentage of GDP. But invariably, the realized deficit is significantly larger. A contributory factor is overly optimistic estimates of donor inflows. The expectation of a certain level of donor contributions, either in the form of outright grants for programs and projects or in the form of program and project loans, triggers government expenditure commitments that entail cash outlays on the part of government, even if the expected donor contributions do not materialize.

The government's expectations of donor inflows and the failure of actual inflows to meet this expectation is not a one-off event. Rather, it is a persistent feature of the budget presentations. This contrasts with the government's ability to project inflows from domestic sources (**Fig. 4**). Based on an average of the last six budgets (1996-2001), the government planned to receive revenues amounting to 19 percent of GDP in the form of direct and indirect taxes, taxes on international trade, and non-tax revenues. It received revenues from these sources amounting to18 percent of GDP.

On the other hand, donor inflows, whether from grants or loans, were expected to amount to 10 percent of GDP on average. They actually came to 7 percent of GDP. The resulting funding gap of 3 percent of GDP had to be financed domestically, either by borrowing in the domestic bond market or by money creation. It is thus no accident that realized net domestic financing is 3 percent of GDP in excess of planned net domestic financing.

Fig. 4. Planned vs Realized Revenue Outcomes: Average of 1996-2001 Budgets



This unplanned recourse to domestic financing is the root cause of the macroeconomic stability that Ghana has experienced. If the gap is financed by printing money, the result is inflation. If it is financed by additional borrowing, the result is higher interest rates.

The predictability of the shortfalls in donor inflows means that the government can deal with them in the budgeting process and thereby avoid having to finance the gap domestically. For example, it could budget a surplus of 3 percent of GDP in that part of the budget not affected by donor flows. It could reduce the growth of expenditures and defer the commitment to start new projects until donor funding is actually available.

Conclusions

The composition of Ghana's domestic debt, currently nearly all 91-day and 182-day Treasury bills, changed over time in response to changes in inflation and in the superior returns offered by the ST instruments. What is desired and needed is a bond market offering a broader array of financial instruments spanning the short-, medium- and long-terms. A necessary condition for this to occur is an active secondary market in which interest rates on all instruments are set by market forces, not by government fiat. In such a market, the interest rate on longer-term maturities will typically carry a premium over short-term interest rates to compensate bond holders for the greater risk of holding longer-term instruments.

Government and investors will also be better served by the secondary market if it operates in a stable economic environment. Ultimately, public sector debt management in Ghana means reducing the public sector deficit so that the stock of government debt does not grow at a rate exceeding the economy's capacity to repay it. Smaller deficits will also reduce inflation and thereby allow nominal interest rates to come down. The need to reduce inflation has increased with the introduction of inflation-indexed bonds. A resurgence of inflation could mean higher debt servicing costs, because indexing prevents the erosion of principal that otherwise tempts cash-strapped governments to inflate themselves out of their predicament, i.e., to repay past loans by issuing currency with less purchasing power.

Ghana's External Debt Crisis:
Exchange Rate and Financial Policies in the Presence of Large Fiscal Deficits

Curtis E. Youngblood
David L. Franklin

Sigma One Corporation
P.O. Box 12836
Research Triangle Park,
North Carolina 27709

November 2001

This work was done while working for the United States Agency for International Development Mission to Ghana under the Trade and Investment Reform Program - Contract No. 641-C-00-98-00229. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Agency for International Development.

Ghana's External Debt Crisis: Exchange Rate and Financial Policies in the Presence of Large Fiscal Deficits

1.0 Introduction

Over the decade of the 1990s Ghana was considered an example among African countries regarding the pace and extent of its economic reforms affecting its trade regime, its financial sector, and the conduct of its fiscal and monetary policy (Kapur et al., 1991). This reputation was earned in the latter half of the 1980s when Ghana's government, under the Provisional National Defense Council (PNDC), instituted a series of policy measures to rescue its economy from the depths of its most severe crisis in the post-colonial period. This program, the Economic Recovery Program (ERP), appeared to place Ghana on a path of economic growth, at least through its first 10 years: from a per capita GDP of $309 in 1983 (down from its high of $485 in 1971) to $371 in 1993. In spite of this early promise and the good reputation it achieved with the international financial institutions, international donors and its own private enterprise sector, Ghana's recent economic experience has failed to keep up with the early promise of the ERP. Per capita GDP in 2000 was $411. Yet, it is perplexing to most observers that in March 2001 the recently elected government of the New Patriotic Party (NPP) sought relief under the Highly Indebted Poor Countries (HIPC) initiative, as it dealt with the aftermath of a massive currency crisis, the second in 8 years.

Ghana sought relief under HIPC because the newly elected government discovered a fiscal gap of 6.9% of GDP ($367 million) for 2001, which resulted from its obligations to service external debt. External debt in Ghana was $2,075 million in 1985 (46% of GDP), $3,124 million in 1990 (50% of GDP), $5,093 million in 1995 (79% of GDP), and $5,815 million in 2000 (114% of GDP). Over this period, fiscal policy was characterized by persistently large ex-post primary deficits which were financed by domestic borrowing, external borrowing, and printing money. Throughout the 1990's, nominal interest rates averaged 34%, the nominal exchange rate depreciated by 33% per year and the rate of annual inflation averaged 27%.

Table 1. Budget Deficits and Selected Indicators of Macroeconomic Instability

	Broad Budget Deficit (% of GDP)	Base Money Growth (% per year)	Inflation (% per year)	Nominal Interest Rate (% per year)	Real Interest Rate (% per year)	Exchange Rate Depreciation (% per year)
1990	-2.1	16.5	37.3	23.1	-10.4	20.9
1991	-1.4	-4.0	18.0	31.5	11.4	12.7
1992	-8.7	32.2	10.1	20.4	9.4	18.8
1993	-7.4	44.4	25.0	33.5	6.9	48.5
1994	-3.8	35.4	24.9	29.8	3.9	47.4
1995	-4.0	53.1	59.5	38.8	-12.9	25.5
1996	-8.4	43.7	46.6	46.5	-0.1	36.4
1997	-10.1	41.9	26.0	47.9	17.4	25.2
1998	-8.1	24.6	16.4	37.6	18.3	12.9
1999	-5.1	19.0	12.4	28.2	14.1	14.4
2000	-7.4	14.5	25.2	39.3	11.3	101.0
Average	-6.05	29.21	27.4	34.24	6.3	33.06

Source: IMF and Bank of Ghana.

The fundamental source of this instability is the Government's persistent spending in excess of its revenues. Public sector expenditures have averaged nearly 27% of GDP for the 1990-2000 period, whereas public sector revenues from all sources have averaged 20% of GDP. The result has been string of broad public sector deficits that has averaged 6% of GDP during the 1990-2000 period (**Table 1**).

The current debt crisis is the consequence of the use of the nominal exchange rate as a policy instrument to achieve multiple and inconsistent objectives in the presence of these persistently large deficits. We will demonstrate that under a consistent policy regime regarding the nominal exchange rate, Ghana's present debt crisis could have been avoided. In this paper we present a brief description of monetary management during the 1990s and the use of the nominal exchange rate both as an instrument for repression of inflation and external debt service and as a taxing mechanism for foreign exchange inflows from exports and official development assistance. As a result, in 2000 Ghana's stock of external debt as a share of GDP was nearly twice what it would have been under a more flexible nominal exchange rate regime, even given the same stream of broad public sector deficits.

The nominal exchange rate was used to repress the financial consequences of fiscal and monetary policy, and this led to two speculative assaults on the currency (1992-93 and 1999-2000). In this paper we describe the conditions leading to these attacks and the consequences thereof. We use a simple open economy rational expectations framework to assess that the eventuality of such crises was predictable. We use a framework developed by Riesen (1989) and others to demonstrate that the large increase in external indebtedness as a share of GDP in 2000 could have been avoided under a more flexible nominal exchange rate regime.

2.0 Analytical Framework

Fiscal deficits are financed through domestic borrowing, external borrowing, and money creation; each source of financing has its corresponding cost. Borrowing from financial markets requires servicing of the resulting debt at the prevailing real rate of interest. Financing through money creation generates inflation and its concomitant social costs. Additionally, inflationary finance can lead to expectations of future inflation and a higher social burden to finance a current fiscal deficit. When deficits persist, monetary policy can be ineffective in reducing the rate of inflation. Sargent and Wallace (1986) show that if the real rate of interest exceeds the economy's real growth rate, the monetary authority faces an unpleasant choice: inflation now or inflation later. If the central bank chooses low inflation now as an objective, the deficits must be financed by issuing additional interest-bearing debt. This current borrowing at real rates of interest that exceed economic growth will ultimately require higher rates of money growth to finance the future deficits and the increasing debt servicing requirements.

This occurs because eventually the real stock of interest-bearing debt either consumes all of the savings in the economy or reaches some threshold value representing the maximum holdings of willingly-held debt by the private sector. At this point, the fiscal authority can raise taxes, reduce spending, or do both so as to generate surpluses and pay down the real stock of

government debt.[1] Failing that, the monetary authority has no choice but to issue base money to finance the deficit. As Sargent and Wallace point out, the larger the value at which the real debt stock is stabilized, either the tighter subsequent fiscal policy has to be or the greater future monetary expansion (and inflation) has to be. If the monetary authority chooses to avoid this outcome by financing more of today's deficits by issuing high-powered money, then the consequence is high inflation today rather than in the future[2].

Krugman (1992) shows what happens when the government runs persistent deficits and pegs the exchange rate. The deficit can be financed either by issuing high-powered money or by running down international reserves. He shows that a speculative attack on the currency, in which the private sector acquires all of the government's reserves by exchanging domestic currency for foreign currency, is not a matter of "if" but of "when". The timing of the attack is determined by the initial stock of reserves: the bigger the stock of reserves with which the government can defend the exchange rate, the greater the delay in the timing of the speculative attack, but the greater the increase in the private sector's net wealth after it makes the attack. That is, the depreciation of the currency will be greater the longer the attack is postponed by the central bank's intervention (pegging) in the foreign exchange market.

These two models capture salient features of how policymakers in Ghana have managed fiscal, monetary, and exchange rate policy since 1987. These insights serve to illustrate that the ultimate failure of monetary policy to stabilize the Ghanaian economy was predictable. In our opinion, the crisis of 2000 could have been avoided had the Bank of Ghana not used the nominal exchange rate as an anchor during 1997-1999.

To illustrate this point, we use an accounting framework for a public sector that is broadly defined, i.e., one that incorporates the activities of any entity or institution that undertakes a fiscal activity, whether that institution is formally classified as part of the central government or not. Many public sector activities in Ghana occur outside the purview of the central government, e.g., those undertaken by the large number of state-owned enterprises (SOE's). In addition, the Bank of Ghana performs quasi-fiscal functions; for example, the government's financial dealings with the IMF are recorded on the books of the Bank of Ghana. For these reasons, we deal with the *consolidated* public sector, which includes the fiscal activities of the SOE's (e.g., subsidized energy and public utilities) and the Bank of Ghana.

The accounting framework consists of an equality constraint with uses of funds (spending) on one side and sources of funds (financing) on the other. The three sources of financing (inflationary taxation of the monetary base, issuing domestic debt, and borrowing externally) can grow at the real rate of growth of the economy without increasing the financing burden as a share of GDP. The equality is the consolidated public sector's budget constraint, and thus serves as a criterion for judging fiscal performance.

[1] A balanced budget would not suffice: since the real interest rate exceeds the rate of real economic growth, even rolling over an existing stock of debt would entail raising additional revenues merely to meet the real interest payments.

[2] Actually, Sargent and Wallace show that in a model in which the demand for base money depends on expected inflation, the monetary authority's choice of tighter money today not only means higher money growth rates and inflation in the future, but also higher inflation today.

The financing constraint of the consolidated public sector expressed as shares of GDP is:

$$\delta + (r - q)\beta + (r^* + \hat{e} - q)\varphi = (q - \theta + \pi)\mu + \dot{\beta} + \dot{\varphi}$$

where

δ is the real primary deficit (non-interest expenditures net of revenues from all sources),
r is the real rate of interest on domestic debt,
q is the real GDP growth rate,
β is the real stock of domestic debt,
r* is the real rate of interest on external debt,
$\hat{e}$ is the proportional deviation of the real exchange rate from purchasing power parity,
φ is the real stock of external debt,
θ is the proportional change in the income velocity of base money,
π is the proportional change in the GDP deflator, and
μ is the real monetary base.

Because Ghana has experienced high and variable rates of inflation and nominal depreciation, nominal values of items in the budget obscure critical distinctions between the uses of funds and the sources of funds. Accordingly, we correct all variables in the financing constraint for the effects of inflation and real exchange rate changes. This properly accounts for the accelerated amortization of debt induced by inflation and the capital gains and losses caused by real exchange rate changes as financing items rather than as expenditure items.

This framework has been used primarily to judge the consistency of monetary and fiscal policy in meeting selected macroeconomic targets (Anand and van Wijnbergen (1989) and Catsambas and Pigato (1989)). Macroeconomic targets, such as a target inflation rate or a desired debt-to-output ratio, impose restrictions on the financing sources, as Anand and van Wijnbergen point out. The restrictions on financing in turn lead to a primary deficit that is consistent with the targets. If the actual deficit is greater than the one consistent with the targets, one or more of the macroeconomic targets cannot be met. Riesen (1989) uses the framework to trace the fiscal impact of a change in the real exchange rate and calculates the degree of fiscal discipline needed to sustain a significant real depreciation and to achieve a low rate of inflation. We will use the framework, first, to see how the consolidated public sector deficit has been financed over 1987-2000 and, second, to evaluate the outcome on the external debt-to-output ratio of an alternative exchange rate policy.

2.1 Expenditures of the Consolidated Public Sector

Expenditures in this constraint comprise the primary deficit and interest expenditures on domestic and international debt. The primary deficit, δ, is non-interest expenditures net of tax and non-tax revenues, including grants from international donors, as well as receipts from divestiture of SOE's.[3] The burden of servicing the domestic debt, $(r - q)\beta$, is lower the higher

[3] This concept of the primary deficit differs significantly from the *domestic* primary deficit reported by the Government of Ghana in its budget statements and reproduced in IMF publications. The domestic primary deficit excludes both grants and divestiture receipts from revenues, and foreign capital expenditures and arrears clearance

the rate of real economic growth. If real interest rates are equal to the rate of growth, there is no increase in the share of the burden borne by the private sector.

For the consolidated public sector, external liabilities include the external debt taken on by the central government, the SOE's, and the Bank of Ghana, net of foreign assets held by the Bank of Ghana. The transfer of real resources embodied in interest payments to external creditors, $(r^* + \hat{e} - q)f$, depends critically on the real exchange rate at which payments must be made. The foreign exchange ultimately comes from converting domestic resources at the real exchange rate. Even if the government books an external interest payment at an exchange rate more favorable than the equilibrium exchange rate or makes the payment from the proceeds of a new loan, the payment still carries an opportunity cost equal to the real exchange rate (Krugman). The real resources required for interest payments on the external debt are offset by economic growth, as is the case with domestic debt service. These aspects of interest expenditures relative to real economic growth reflect one of the important elements of the Sargeant and Wallace paper.

2.2 Sources of Finance for the Consolidated Public Sector

The financing alternatives available to the consolidated public sector are money creation, domestic borrowing, and international borrowing. The tax base for money creation is the real monetary base as a share of GDP, μ. The public sector captures revenues by taxing this base through inflation, π. As inflation induces flight from the domestic currency, the yield of the inflation tax will be lower. The public sector also captures seignorage revenues, $(q - \theta)\mu$, that are generated as the net demand for base money rises with increases in real GDP.

Domestic borrowing is measured as the change in the real stock of domestic debt instruments held by the private sector, $\dot{b}$. International borrowing by the consolidated public sector is measured as the change in the real stock of external debt as a share of GDP, $\dot{f}$. The gross external liabilities of the central government and the Bank of Ghana are measured by the stocks of short-, medium-, and long-term debt held or guaranteed by the public sector, including borrowings from the IMF, partially offset by the foreign assets of the BoG.[4]

3.0 Monetary Management Practices in Ghana

In this section we examine how the Bank of Ghana has reacted to the persistent stream of large public sector deficits over the 1987-2000 period. We begin our analysis in 1987 because major macroeconomic and microeconomic reforms were adopted then.[5] We break up this period into sub-periods according to movements in two indicators of financial sector conditions (**Fig. 1**) because these indicators signal major changes in monetary management practices. The two indicators are the real interest rate on 91-day Government of Ghana Treasury bills and the

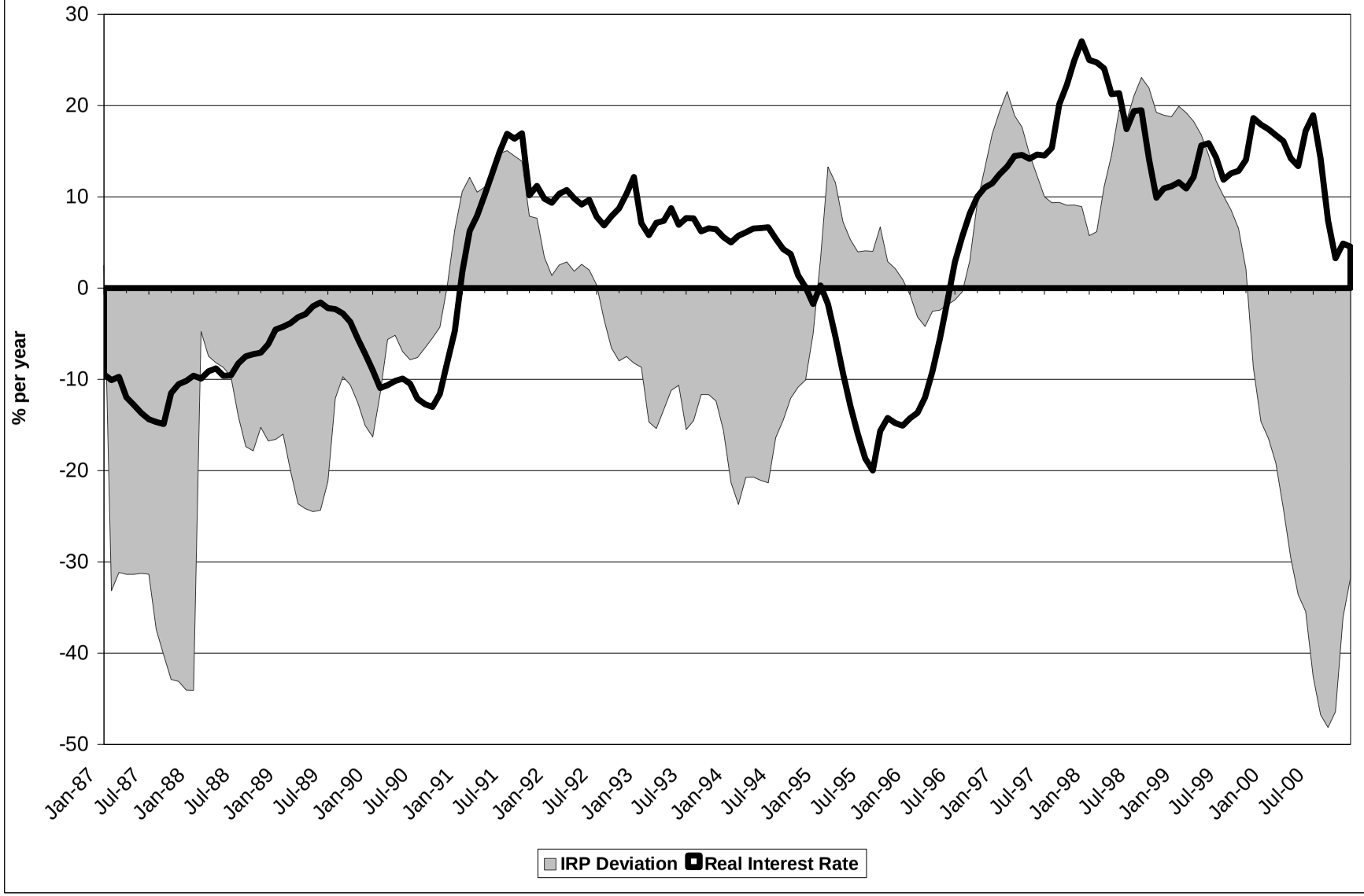
---

from expenditures. Since the excluded expenditure items are usually much larger than the excluded revenue items, the domestic primary balance often shows a surplus, whereas the broad primary balance we calculate either shows a deficit or a much smaller surplus. The broad primary balance is a more complete measure of the financing burden that the economy must support.

[4] Hence, this measure will differ from the commonly reported external debt statistics for Ghana by the amount of foreign assets held by the BoG.

[5] For example, the financial sector was restructured and exchange rates were unified and a managed float instituted. Other reforms are discussed in section 4.1.

Fig. 1. Indicators of Monetary Management Practices



deviation of GoG T-bills from interest rate parity (IRP) with 3-month U. S. Treasury bills. The real interest rate serves to assess conditions in the domestic debt market in the context of Sargent and Wallace (1986), whereas the IRP indicator serves to assess conditions in domestic financial markets relative to the exchange rate (Krugman 1992).

The real interest rate is given by

$$r = \frac{i - \pi}{1 + \pi}$$

where i = annualized nominal interest rate on 91-day Government of Ghana Treasury bills,
r = real interest rate, and
π = annual (year on year) change in the consumer price index.

This is the price signal for individual and institutional savers in allocating the proportions of their domestic assets they wish to hold as currency, public sector debt, and other assets. The nominal interest rate and the inflation rate used to compute the real interest rate indicator are depicted in **Fig. 2**.

The interest-rate parity (IRP) condition is

$$\frac{i - r}{1 + r} = i'$$

where ρ is the percentage change in the nominal exchange rate measured in cedis per US dollar[6] and i' is the annualized nominal interest rate on 3-month US T-bills. The deviation from IRP is the left-hand side of the above condition minus i', i.e., at equilibrium the deviation would be zero, and is plotted in **Fig. 1**.

The presence of very large positive deviations indicate either the potential to make abnormally large profits by purchasing domestic debt or an expectation of further depreciation of the cedi. If these large positive deviations persist, then we would conclude that the former possibility is more likely, because all else equal, we would expect to see individuals and institutions shifting the composition of their financial wealth towards domestic debt. Large negative returns are an indicator of financial repression supported by impediments to the free flow of capital into and out of Ghana. Two of the key variables used to compute this measure, the nominal interest rate and the yearly rate of depreciation, are depicted in **Fig. 3**.

These indicators capture movements in three prices that the Bank of Ghana (BoG) either perceives itself to be responsible for or is widely perceived by others to be responsible for. These prices are the inflation rate, the nominal interest rate on Treasury bills, and the exchange rate. The Bank controls inflation primarily by controlling growth in the broad money supply, which in turn the BoG influences by targeting growth in high-powered money (currency in

[6] A positive value for ρ therefore implies nominal exchange rate depreciation. We use the dollar as the reference currency as a matter of convenience, because most of Ghana's trade is denominated in US dollars and any discrepancies with a trade-weighted measure would be minor.

Fig. 2. Inflation and Nominal Interest Rates

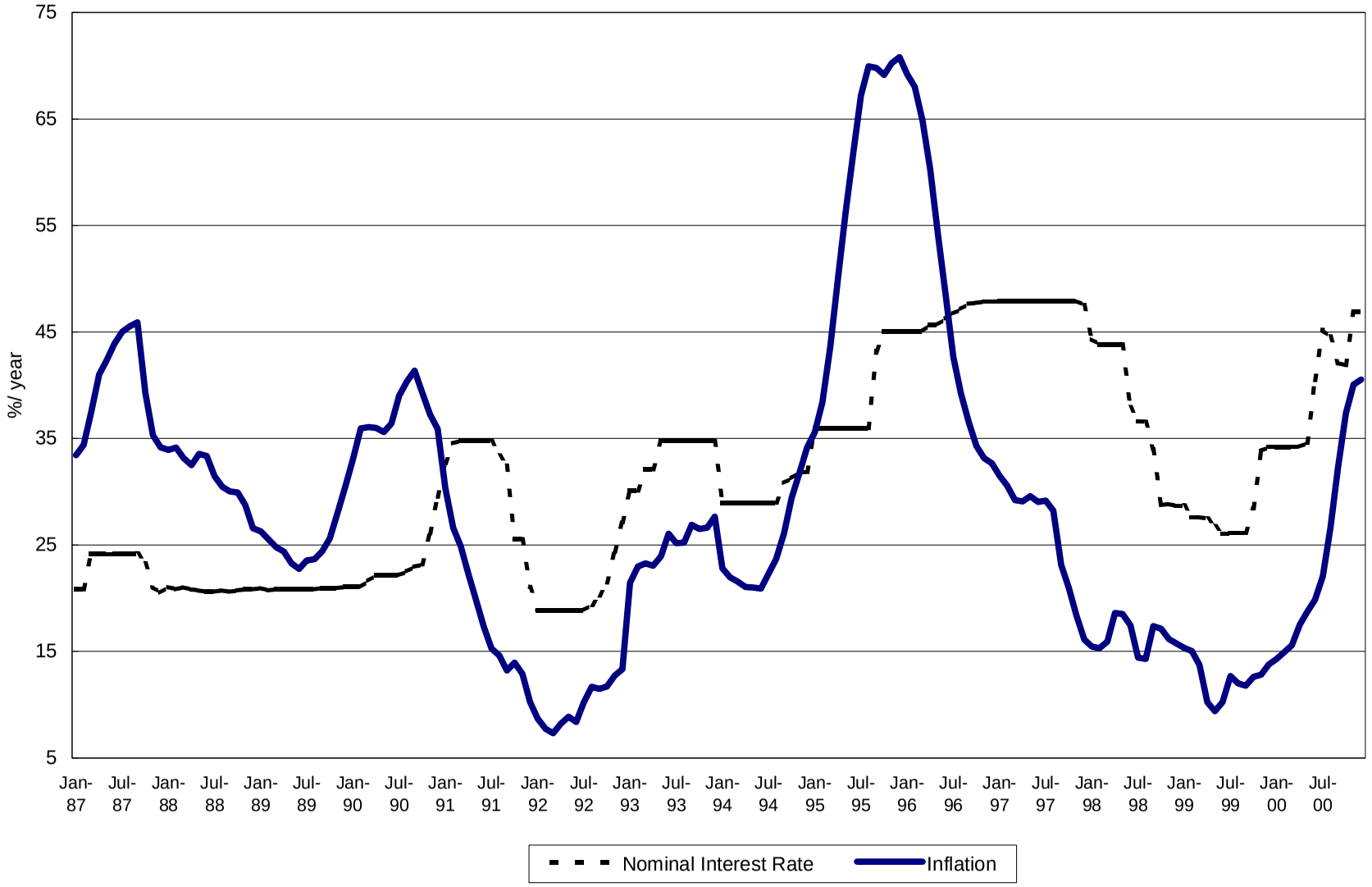
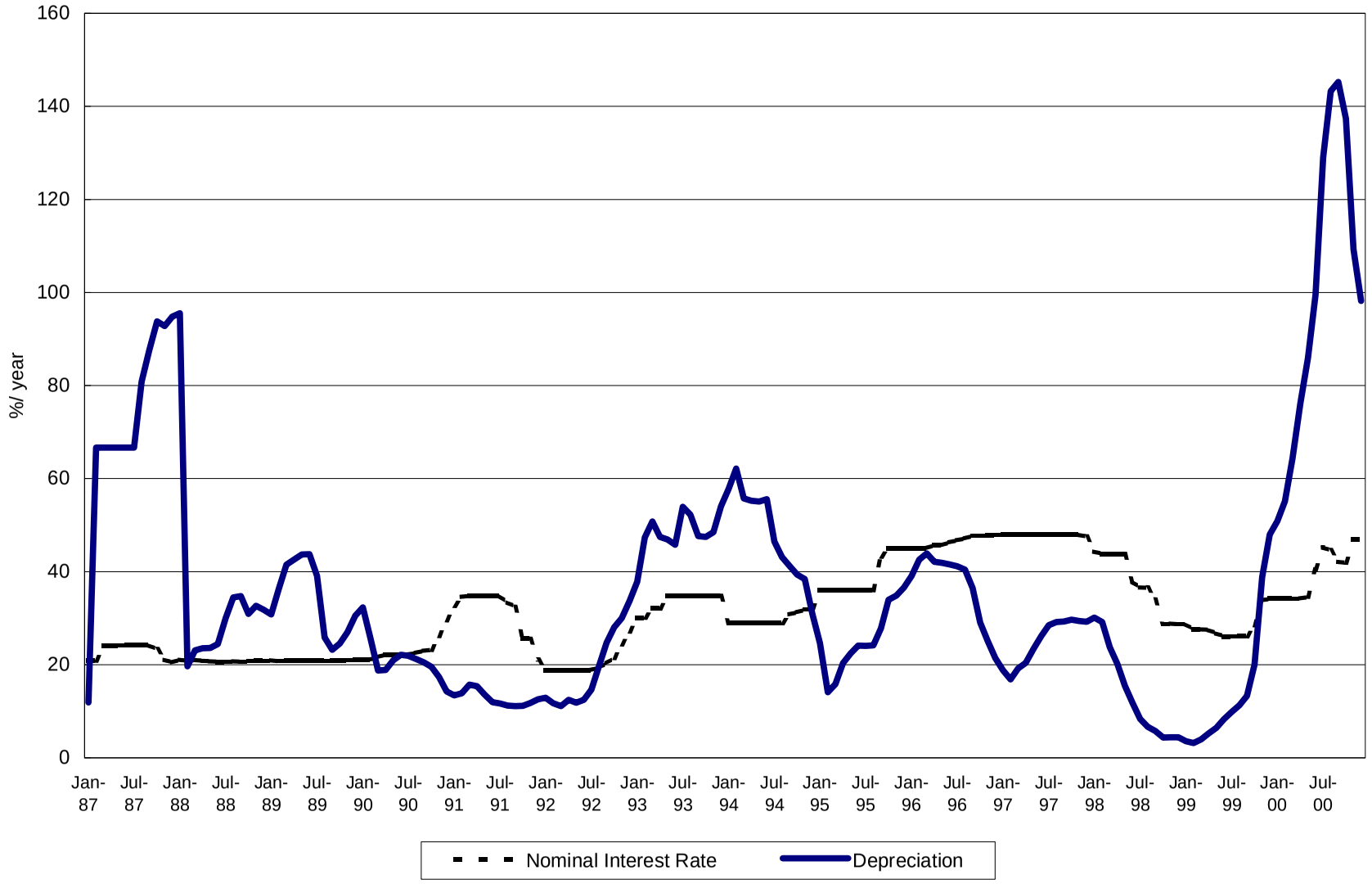


Fig. 3. Nominal Interest Rates and Nominal Depreciation



circulation plus banking system deposits at the central bank). The nominal interest rate on Treasuries is set at the weekly auction conducted by the Bank of Ghana. Despite frequent references to market-determined interest rates, they are not (Gockel, 2000); in fact, the BoG sets the interest rate in collaboration with the GoG, with the overriding consideration being what the government can afford to pay (Youngblood, 2000). The BoG intervenes, sometimes extensively, in the foreign exchange market to control the rate of depreciation of the cedi. Unless sterilized, BoG sales of foreign exchange reduce the growth of high-powered money and moderate the rate of depreciation of the cedi against foreign currencies. Maintaining a stable value of the nominal exchange rate is one of the BoG's legislated objectives. The nominal exchange rate is a highly visible sign of the stability (or lack thereof) of the economy.

Of these three prices, the BoG probably has the least direct control over the inflation rate. The link between money growth and inflation is strong, but it operates with a lag and the ultimate effect on the price level of a given injection of high-powered money is not exact. CEPA (1996) has estimated that an injection of liquidity operates as a source of inflation for about three quarters.

The BoG and the GoG can set the nominal (*not* the real) interest rate at any specific value they wish. The value at which the nominal rate is set is intended to control the Treasury's debt service requirements; however, this usually results in an undersubscribed auction, i.e., the value of the bids awarded is less than the amount of securities offered for sale. Given sufficient foreign exchange reserves and its ability to use moral suasion (because the BoG is the supervisory body of the financial system), the BoG can also exert control over the nominal exchange rate in the short run.

We used the two indicators in combination to characterize the monetary management practices of the BoG during the reference period. As can be seen in **Fig.** 1, the period (1987-2000) can be divided into sub-periods by using changes in sign of the two indicators as thresholds that signal changes in the policy stance of the monetary authority.

4.0 Anatomy of Two Speculative Attacks

4.1 Build-up to the 1992/93 Attack

In the late 1980's through 1990, Ghana was attempting to remove the causes of financial repression. It did away with the credit ceilings and targets that attempted to direct bank lending towards certain sectors of the economy. It also introduced various maturities of BoG and Treasury securities as the basis for a new system of monetary control. It undertook the recapitalization and restructuring of the financial system to repair the damage caused by years of financial repression. This was also a period of foreign exchange market and trade policy liberalization, characterized by a shift from fixed exchange rates to a crawling peg and finally to a managed float; by the legalization of foreign exchange bureaus and a broadening of the transactions permitted in them; and by the abolition of all import licensing requirements.

As a result of these changes, over the period 1987-1990, the cedi depreciated in real terms by 1% per month and on a nominal basis by nearly 3% per month (see **Table 2**). Financial market signals favored holding dollar assets (the deviation from IRP averaged nearly 18% per year), because nominal interest rates did not compensate for the depreciation in the nominal exchange

rate. Nevertheless, the relative return to holding cedi assets improved throughout this period (see **Fig. 1**).

Throughout much of this period nominal interest rates were not actively used as either an instrument or an operating target of monetary policy. As a result, real interest rates were a *negative* 9% on average. Instead, reserve requirements were the primary instrument of monetary policy. Primary and secondary reserves (respectively, deposits at the BoG and approved securities that banks are required to hold as a percentage of their deposit liabilities) were around 30% in 1987 but were raised occasionally to 42% by the end of 1990. Over this time, primary reserve requirements were lowered and secondary requirements were raised, perhaps to provide sufficient incentives for banks to hold government paper that carried a negative real return. Another striking feature of this period is the strong downward trend in base money growth (measured on a year-on-year basis and plotted in **Fig. 4**). Annual growth in high-powered money decreased from around 60% at the beginning of 1987 to zero by the end of 1990. This was possible because the government was relatively disciplined over this period: the conventional broad budget deficit averaged only 1% of GDP.

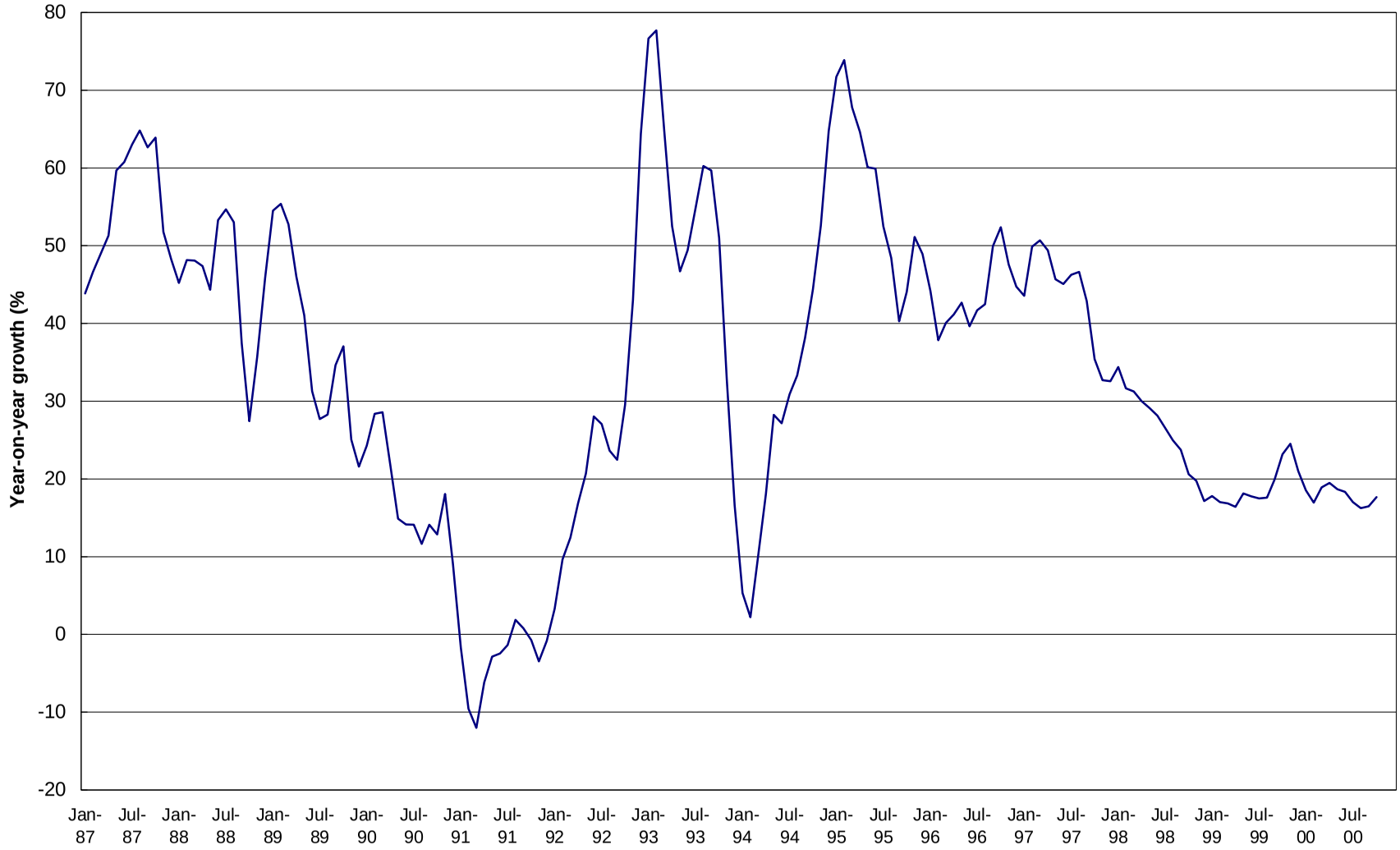
Table 2. Financial System Variables: Monthly Averages for Selected Periods*

	1987-1990	**1991 - mid 1992**	**mid 1992 – 1994**	**1995 – mid 1996**	**mid-1996 – 1999**	**2000**
Monthly base money growth	2.2	0.7	4.1	2.0	2.3	1.2
Average monthly inflation	2.3	1.0	1.9	4.1	1.3	2.9
Nominal T-bill rate (% per year)	21.9	27.3	29.4	41.1	39.4	39.3
Beginning of period	20.8	32.7	18.9	36.0	46.3	34.2
End of period	29.5	18.9	31.9	46.3	34.2	46.9
Nominal depreciation	2.9	1.0	3.2	2.6	1.8	5.9
Real depreciation	1.0	0.3	1.4	-1.1	0.7	3.2
Deviation from IRP (+ favors cedi assets)	-17.9	8.2	-12.4	2.8	11.7	-34.2
Real interest rate (% per year)	-8.5	10.8	6.3	-11.1	15.0	12.4
Beginning of period	-9.5	1.8	9.7	0.3	-1.5	17.4
End of period	-4.7	9.7	-1.7	-1.5	17.9	4.5
Change in real domestic debt	-0.9	3.0	2.5	-0.8	1.5	-1.5

*All numbers are in percent per month, unless otherwise noted.

Towards the end of 1990 until the middle of 1991, a new policy stance became apparent. Nominal interest rates were raised sharply from 23% to 35% to reflect a tighter monetary policy. Real interest rates became highly positive. Inflation declined steadily during 1991, nominal interest rates were subsequently lowered, but real interest rates remained positive. This provided a powerful incentive for banks, institutions, and individuals to willingly hold securities issued by the BoG and the GoG. As a result, the real stock of domestic debt grew rapidly. For example, domestic debt as a percent of GDP hovered around 3% from 1987-1990 when real interest rates were negative. However, from 1991-1994 when the real interest rate averaged 8%, real domestic

Fig. 4. High-powered Money Growth



debt stocks grew at an average of 3% per month. Thus, by the end of 1994, the stock of real domestic debt stood at nearly 11% of GDP. At the same time, growth in the real economy was averaging 4.7% per year. The lesson from Sargent and Wallace (1986) is that this situation was not sustainable: economic agents would realize that the government will ultimately have to print money in order to service its interest-bearing debt, unless the government began generating budget surpluses.

Another set of circumstances sharply increased the likelihood of the recourse to inflationary finance: Ghana's transition to democratic rule, with elections scheduled for November 1992, and the desire of the ruling PNDC party to be legitimized in this election, led to a deficit of 8.7% of GDP in 1992. The government promised and delivered a retroactive 35% wage increase to government workers in the last quarter of 1992 that was paid for by borrowing from the BoG. This injection of liquidity resulted in a 90% increase in the stock of high-powered money over its level at the end of 1991.

To counteract its massive injection of high-powered money, the BoG issued BoG securities, increased reserve requirements from 42% to 57% (of which the secondary reserve requirement was 47%), and, most importantly, intervened extensively in the foreign exchange market by selling foreign currencies. These circumstances set the stage for a speculative attack on the currency (the cedi). The government was running very large deficits, the BoG was financing the deficit by printing money, and simultaneously trying to mop up the money it created by selling its limited stocks of foreign exchange. From mid-1992 through the first quarter of 1994, the nominal exchange rate depreciated by 127%. The attack shows up in **Fig. 1** as a switch in the relative return measure from favoring cedi-denominated assets to favoring dollar-denominated assets.

4.2 The Inflationary Aftermath

One pernicious effect of the BoG's injection of high-powered money and the speculative assault on the cedi was a prolonged period of high inflation averaging over 4% per month for an 18 month period (1995-mid-1996). At its height during 1995, inflation exceeded 70% measured on a year-on-year basis (**Fig. 2**). Despite increasing the nominal interest rate from 36% to 46% per year (**Fig. 2**), real interest rates turned sharply negative during this period, averaging a negative 11%. This discouraged holding domestic debt instruments and the real stock of domestic debt declined at an average monthly rate of nearly 1% (see **Table 2**).

The stock of high-powered money and inflationary expectations received an added boost in the last quarter of 1994 when the Ghana National Petroleum Corporation (GNPC) borrowed heavily from the BoG. This resulted in another huge spike in the growth of high-powered money (**Fig. 4**) to annual rates in excess of 70%. In an attempt to mop up the excess liquidity created by the BoG's willingness to finance public sector deficits by printing money, the BoG issued billions of cedis worth of BoG securities in 1994 and 1995. It also kept reserve requirements high—total reserves were 57%, of which secondary reserves were 52%.

4.3 Build-up to the 1999/2000 Speculative Attack

Inflation steadily declined from 70% at the beginning of 1996 to around 10% in 1999. During this period, real interest rates became highly positive once again (**Fig. 1**). They averaged 15%

per year while the real economy grew at 4.5% per year. Budget deficits averaged nearly 8% of GDP per year. In late 1997, with inflation down to 26%, the BoG adopted a policy of using the nominal exchange rate as an anchor for the economy. The decision to adopt the exchange rate as the nominal anchor came after the Inflation Management Roundtable in May 1996 which was led by the late Michael Bruno. Bruno (1989, 1991) had helped design a similar strategy to reduce inflation in Israel. As a result, the nominal rate of depreciation slowed dramatically—during 1998 the nominal exchange rate depreciated by only 3%, while inflation was lowered to 16%.

This combination of incentives (very high real interest rates and very low rates of nominal depreciation) created powerful incentives for wealth to be held in domestic interest-bearing assets, which carried an average premium of nearly 12% per year above dollar-denominated interest-bearing instruments. As a result, real debt stocks grew at 1.5% per month from mid-1996 through 1999. As a percent of GDP, domestic debt swelled from 10% in 1996 to 16% in 1999.

In order for the nominal exchange rate anchor to work, the government should have been running a very restrained fiscal policy. Instead, 1996, 1997, and 1998 were years in which the government was especially profligate in its spending: the broad budget deficit averaged nearly 9% of GDP over this period. Thus, the government ran huge deficits that had to be financed somehow. It attempted to service its domestic debt at real rates that far exceeded the economy's growth rate, and the BoG ran down its stock of scarce foreign exchange reserves to maintain the nominal anchor.

Furthermore, sales of foreign exchange were being used as a type of open market operation to control the growth of base money. Previously, the BoG had been issuing BoG securities to slow the growth of base money. From 1996-1998 BoG securities were retired[7] and Treasury bills, issued by the Government, were supposed to take the place of BoG bills in open market operations. This actually weakened the BoG's ability to conduct monetary policy through open market operations—under the new system of monetary control, the BoG's claim on the proceeds so they could be used for open market operations were secondary to financing the GoG's public sector borrowing requirement (PSBR). The government had first claim on the proceeds, which were used to meet its PSBR, including significant rollovers of debt and interest payments. Only the residual proceeds were used to drain reserves from the banking system in order to meet the BoG's reserve money target (Youngblood 2000).

The foregoing conditions laid the foundation for another speculative attack on the currency. The attack was touched off by a sharp downturn in the terms of trade. In the second quarter of 1999 the price of cocoa and gold fell sharply and the price of petroleum rose significantly. These events continued in the third and fourth quarters of 1999. With an important source of the BoG's supply of foreign exchange threatened, individuals and institutions recognized the unsustainability of the situation and switched out of domestic assets into the safe haven offered by dollars. The cedi depreciated sharply. From June 1999 to June 2000, the cedi depreciated 100%; by the end of the year, the cumulative depreciation reached 174%.

A serious consequence of this depreciation was the increase in the value of the external debt as a share of GDP, which ultimately led to the decision to participate in the HIPC initiative. The

[7] At the end of 1996 BoG securities totaled C518 billion; by the end of 1998, they totaled C1 billion.

attack also boosted the inflation rate to 41% at the end of 2000 through its effect on the prices of tradable goods in the CPI. To stem the attack, the authorities raised the nominal interest rate 20 percentage points, from 26% to 46%, in an attempt to make domestic assets more attractive.

5.0 An Alternative Response to Financing Public Sector Deficits

The real interest rate and the deviations from IRP help us discern the nature of monetary management practices in terms of the relative attractiveness of domestic and foreign assets. From this characterization, we claim that the indicators allow us to apply the insights of Sargent and Wallace (1986) and Krugman (1992) that provide conditions that could predict the eventuality of inflationary finance and needed depreciations as a result of persistently large deficits. These deficits would ultimately need to be financed by printing money, causing inflation, high nominal interest rates and market-induced pressures for currency depreciation.

The monetary authority tried to countervail against these pressures by using the exchange rate as a nominal anchor. The Bank of Ghana intervened in the foreign exchange market to repress depreciation to meet multiple policy objectives which it hoped would lower the current period's cost of financing the deficit and servicing the external debt, thus reducing pressure on the budget as well. This exchange rate policy had the apparent salutory effect of (temporarily) lowering inflation rates, thereby allowing lower nominal and real interest rates, a lower domestic resource cost of servicing the external debt, and, as a bonus, signaled to external and domestic agents that the monetary authority was achieving its strategy for stabilizing the Ghanaian economy.

The Bank of Ghana could have succeeded in its strategy if it had reliable and persistent access to the foreign exchange flows required to sustain its interventions, and if it had been supported by a consistent fiscal policy. However, given that Ghana has experienced persistent and large current account deficits and has had to rely on substantial donor flows to meet the public sector's resource gap year after year, it is surprising that such a strategy was selected. Furthermore, the riskiness of the strategy was increased from the outset given that Ghana's principal trade flows are determined by three major commodities, each of which has highly volatile prices: cocoa, gold, and petroleum.

Our paper has shown that there have been major policy swings with respect to the means of financing public sector deficits. There have been large and prolonged deviations from interest rate parity with abrupt switches in the policy stance from periods of severe taxation of holders of domestic debt followed by abrupt swings to periods of large subsidies to holders of domestic debt. The instruments for taxation were negative real interest rates and accelerated real depreciation whereas the instruments for subsidization were high nominal and real interest rates accompanied by intervention in the foreign exchange market that, in the presence of high inflation, led to substantial real appreciation, thus leading to abnormally high returns to holders of the domestic debt. The deviations from IRP were so substantial that neither regime was sustainable. In the case where domestic debt holders were taxed, the policy stance would induce capital flight and severely reduce the monetary authority's ability to place domestic debt. This would force the monetary authority to resort to inflationary finance or depend on the generosity of donors. Large positive deviations from IRP, which subsidized holders of the domestic debt, were also unsustainable because they depended on the continued availability of foreign exchange which the monetary authority needed to repress the depreciation of the currency.

It is this latter phenomenon that led to two speculative assaults on the currency. In both cases, the assaults were predictable because the flow of foreign exchange available for intervention was limited by the monetary authority's foreign exchange reserves and the willingness of donors to provide foreign exchange in excess of that required to finance the current account deficit; i.e., the amount needed to finance the government's budget deficit with external resources.

The first assault was shorter and its consequence was a bout of inflation. The second assault occurred after along period of intervention and a large build-up of domestic debt which was subsequently used to fuel a deep and prolonged attack on the currency, resulting in a sharp depreciation of 174% and a near doubling of the value of the external debt as a share of GDP.

We compared the experience of the speculative assault against an alternate management strategy relying on exchange rate flexibility, which we have proxied with an exchange rate regime that would have been consistent with purchasing power parity against the US dollar. It is our claim that this alternative would have avoided the speculative assault because it would have reduced or eliminated some of the risk factors that are precursors to a speculative attack: an appreciating and overvalued real exchange rate, a weak financial system, and massive capital flows (Edwards, 1996, 1997). Maintaining parity with the US dollar would have kept the real exchange rate stable. The financial system in Ghana, in response to the huge subsidies being provided to holders of the domestic debt, was taking on more and more Treasury bills. There is evidence that the funds being used to invest in T-bills were being mobilized from foreign currency deposits, which were increasing rapidly; as a result, the net foreign assets of the financial system became increasingly negative (**Fig. 5**), creating a serious overexposure problem. Thus, the financial system, which had never been an effective or efficient intermediary between borrowers and depositors, became even more reliant on making easy profits by investing in T-bills.

There was an additional risk factor present in the case of Ghana that did not play a role in the Mexican crisis of 1994. Fiscal policy in Mexico was consistent with the nominal anchor policy (Edwards, 1996). However, in Ghana the BoG's use of the nominal exchange rate as an anchor was doomed to failure from the start, because fiscal policy, characterized by large and persistent deficits, was totally inconsistent with the chosen exchange rate policy.

The response of the monetary authority to managing the stream of operational deficits presented to it by the fiscal authorities is depicted in **Fig. 6**. Inflationary finance is generally the least used method of finance, usually ranging between 1 and 2 percent of GDP. This somewhat surprising finding is explained by the erosion of the real monetary base following years of inflation. The real monetary base averaged about 15% of GDP in the 1960's and 1970's, but following prolonged periods of inflation the real base had fallen to about 6% of GDP in the 1990's. This much smaller tax base makes this financing option more unstable—a given injection of base money would have greater inflationary consequences than if the real base were much larger—and perhaps explains why the authorities have relied on domestic and external borrowing as financing alternatives in more recent times.

Domestic borrowing, through issuing Government Treasury bills, becomes more important as a financing source when real interest rates are positive and exceed the growth rate of the real economy. The periods 1992-1994 and 1997-2000 are examples of this. But external borrowing is clearly the most important source of deficit finance during much of the period from 1987-2000. Part of this is a quantity effect: Ghana was a "darling of the donors" throughout much of

Fig. 5. Bank Financing of Government Borrowing

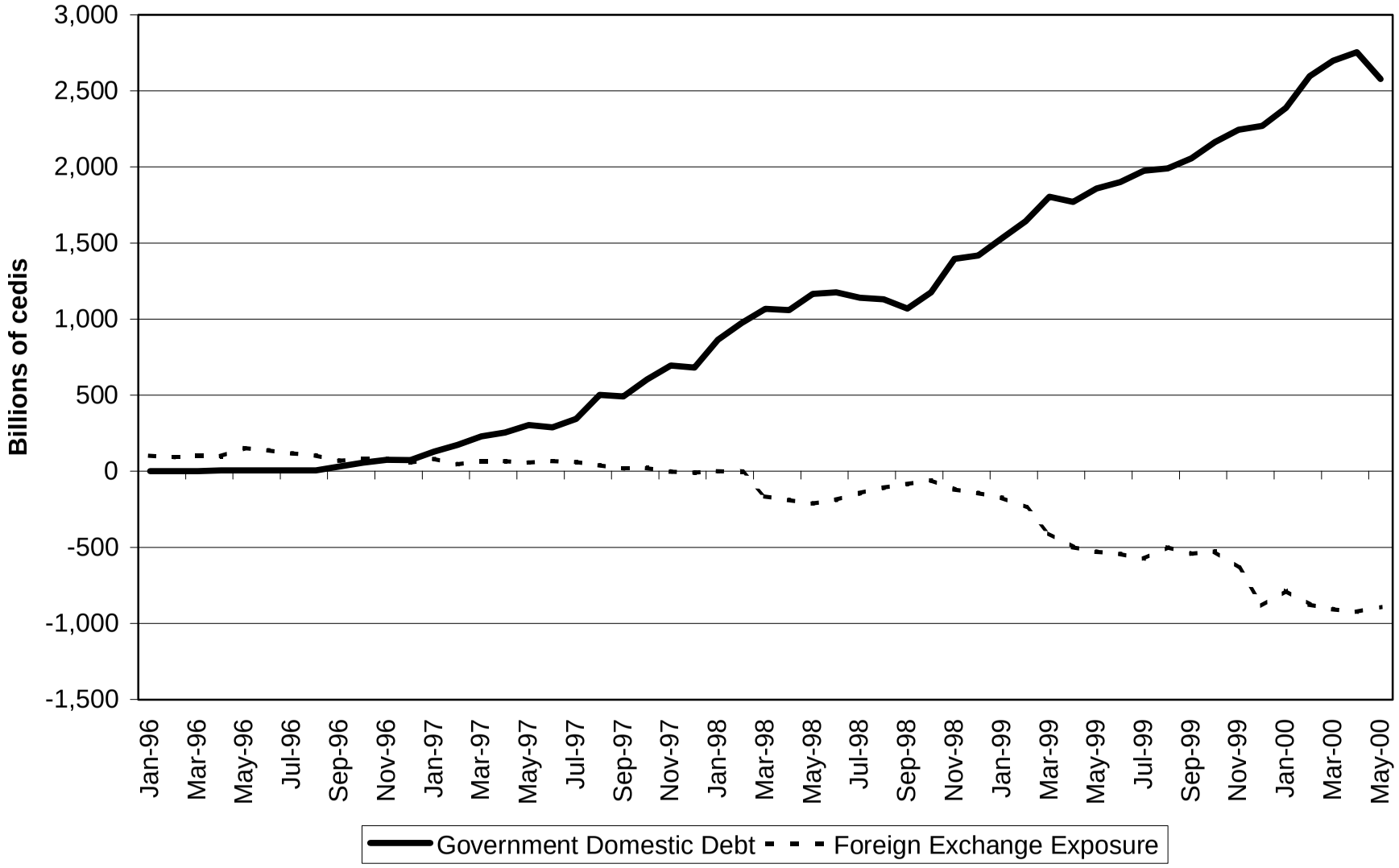
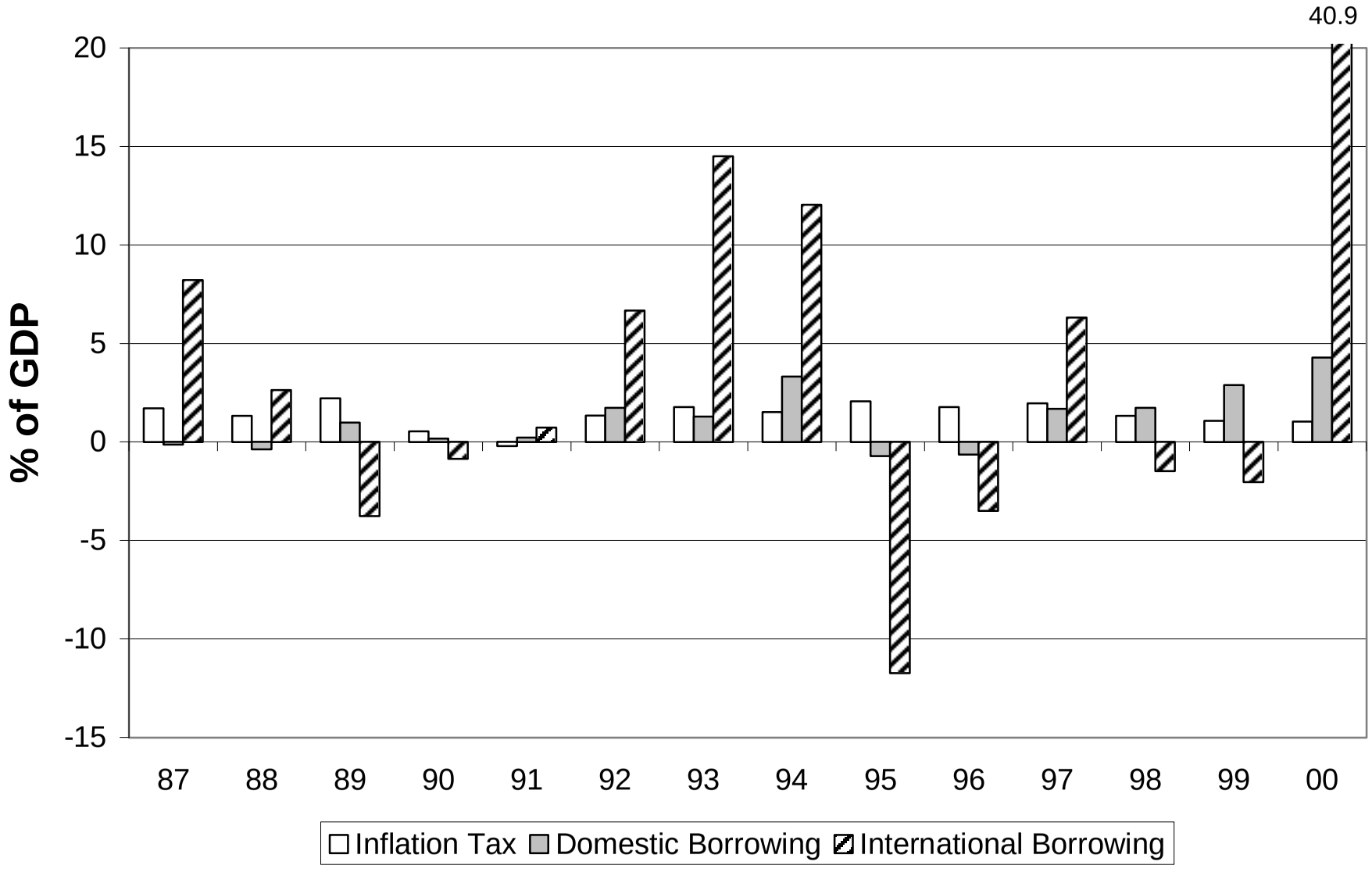


Fig. 6. Financing the Consolidated Public Sector Deficit



this period, thus accounting for the increase in external debt from $2.1 billion in 1985 to $5.8 billion in 2000. But significant increases in Ghana's debt burden arose through a price effect caused by large real depreciations (**Fig. 7**). The speculative attack in late 1999 and 2000 generated a 60% increase in the stock of debt relative to GDP (from 70% to 110%) and forced Ghana to seek relief under the Highly Indebted Poor Countries (HIPC) initiative.

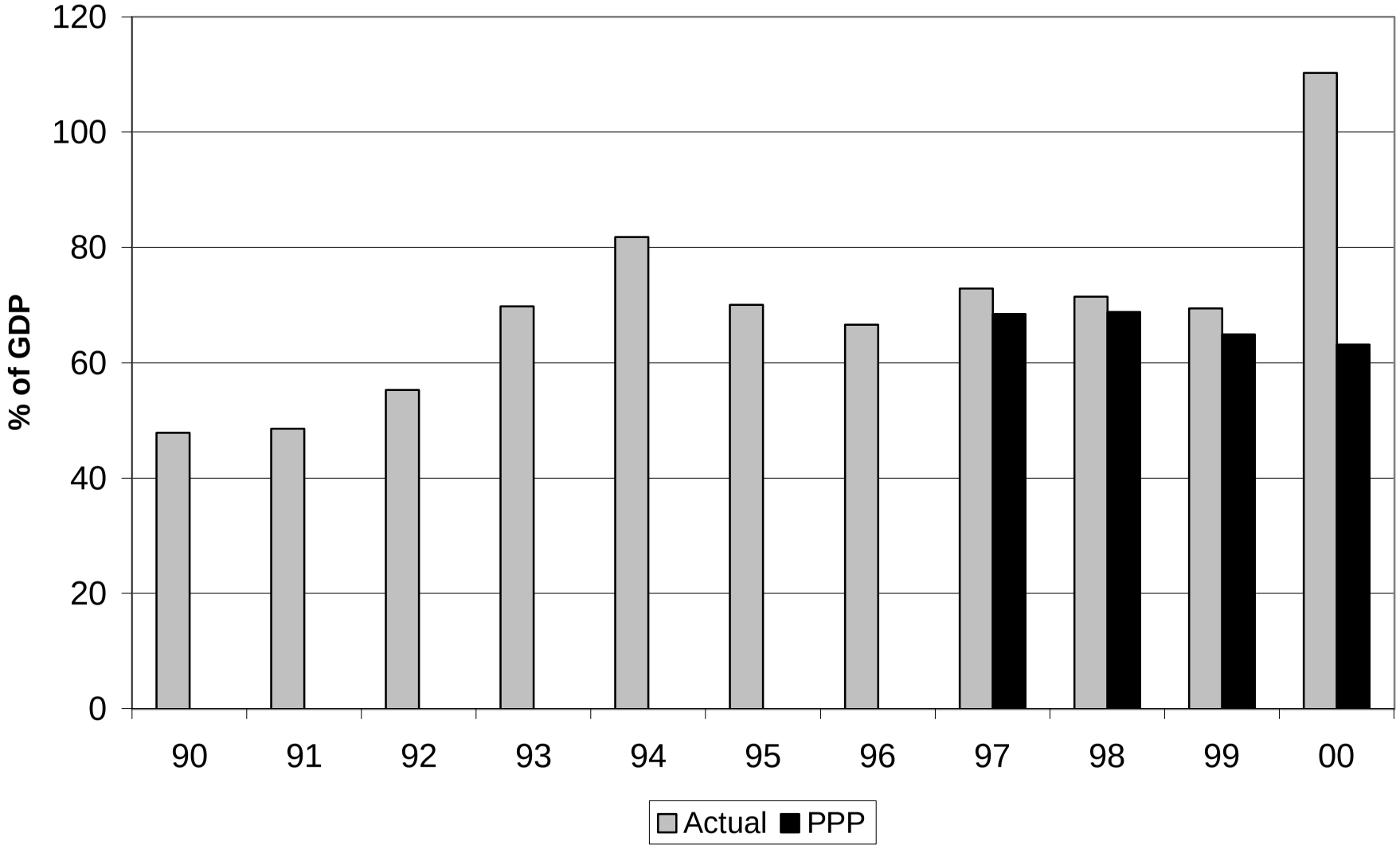
As Fig. 7 shows, this policy did stabilize external debt stocks at around 70% of GDP from 1997-1999. The question arises as to whether an alternative policy would have achieved the same thing at a lower cost to the economy? We argue that the answer to this question is yes, if the authorities had allowed the nominal exchange rate to depreciate just enough to offset the difference between the inflation rates in Ghana and the U.S.

Our alternative scenario presumes that the monetary authorities had adopted this purchasing power parity (PPP) rule in 1997. In terms of the public sector's budget constraint, this means that $\hat{e}=0$, i.e., there are no deviations from PPP during 1997-2000. The real exchange rate for 1997-2000 thus remains at its 1996 value. The effects of following this PPP rule on the stocks of Ghana's external debt are depicted in Figure 7 and can be compared with the existing external debt stocks.

The main benefit of following the PPP rule would have been felt in 2000: external debt stocks would have been 63% of GDP, instead of 110%. Adding up the difference in the debt stocks under the two policies in each of the four years yields a total of almost 3 trillion constant price cedis—over $4 billion US dollars. Of this total, 2.4 trillion cedis would have been realized in 2000, the year in which the effects of the speculative attack were felt. Ghana would not have faced as severe budgetary difficulties in 2000 and 2001 and might therefore have been able to avoid resorting to relief under HIPC.

An important point of the foregoing is that policy makers in Ghana should have seen the risks that were increasing the likelihood of a speculative assault. The Chilean crisis of 1981 was well documented in the economics literature. The Mexican crisis of 1994 was also well understood by 1997, and the Asian currency crisis of 1998 was well underway. Ghana exhibited many of the risk factors that were present in these crises: a weak financial system overexposed to foreign liabilities; constraints on the central bank's ability to respond to shocks and defend its policies; and a monetary policy that was inconsistent with the fiscal realities. The net foreign assets of the banking system were $46 million in January 1997; this position deteriorated steadily over the next three years, so that by September 1999 (immediately prior to the attack) net foreign assets were a *negative* $201 million. The BoG's ability to assist banks by coming up with the foreign assets to cover the banking system's overexposure was limited by the need to accumulate reserves and by the need to honor $300 million in short-term external obligations of the government. The monetary and exchange rate policies of the BoG had created large and persistent deviations from interest rate parity that resulted in abnormally high returns to holders of domestic T-bills. These returns were so high that they could not possibly be expected to last. The authorities were aware of these risk factors and of the experiences of other countries that had suffered currency crises, but chose to do nothing to mitigate these factors. Ultimately, market forces, especially in the foreign exchange market, made the adjustments.

Fig. 7. Ghana's External Debt Stocks



References

Anand, R. and S. van Wijnbergen. January 1989. "Inflation and the Financing of Government Expenditures: Introductory Analysis with an Application to Turkey." *The World Bank Economic Review*, 3, pp. 17-38.

Balino, T. J. T., A. Bennett, and E. Borensztein. (1999). "Monetary Policy in Dollarized Economies." IMF Occasional Paper No. 171. International Monetary Fund: Washington, D.C.

Bawumia, M. November 2000. "Monetary Growth, Exchange Rates and Inflation in Ghana." Research Department. Bank of Ghana: Accra.

Bruno, M. March 1989. "Econometrics and the Design of Economic Reform." **Econometrica**, Vol. 57, No. 2, 275-306.

Bruno, M. June 1991. "High Inflation and the Nominal Anchors of an Open Economy." Essays in International Finance No. 183. Princeton University Press: Princeton.

Catsambas, T. and M. Pigato. October 1989. "The Consistency of Government Deficits with Macroeconomic Adjustment: An Application to Kenya and Ghana." Policy, Planning, and Research Working Paper 287, Africa Technical Department: The World Bank.

Edwards, S. October 1996. "A Tale of Two Crises: Chile and Mexico." Working Paper 5794. National Bureau of Economic Research: Cambridge, MA.

Edwards, S. December 1997. "The Mexican Peso Crisis: How Much Did We Know? When Did We Know It?" Working Paper 6334. National Bureau of Economic Research: Cambridge, MA.

Fischer, S. and W. Easterly. July 1990. "The Economics of the Government Budget **The World Bank Research Observer**, Vol. 5, No. 2, 127-142.

Gockel, A. F. July 2000. "The Bank of Ghana's Role in Providing Liquidity to the Financial Markets Versus Using the Nominal Exchange Rate as an Anchor for the Price Level." Background Paper Prepared for Bank of Ghana and Funded by Sigma One Corporation. University of Ghana: Legon.

Kapur, I., M. T. Hadjimichael, P. Hilbers, J. Schiff, and P. Szymczak. September 1991. "Ghana: Adjustment and Growth, 1983-91." Occasional Paper No. 86. International Monetary Fund: Washington, D.C.

Krugman, P. R. 1992. "A Model of Balance-of-Payments Crises." Chapter 4 in **Currencies and Crises** by Paul R. Krugman. The MIT Press: Cambridge.

Research Department, Bank of Ghana . May 1996. "Inflation Management by Bank of Ghana: The Strategies, the Difficulties and the Way Forward." Paper presented at the Inflation Management Roundtable, Akosombo, May 20-21, 1996.

Riesen, H. November 1989. "Public Debt, External Competitiveness, and Fiscal Discipline in Developing Countries." Princeton Studies in International Finance No. 66. Princeton University Press: Princeton.

Sachs, J., A. Tornell, and A. Velasco. June 1995. "The Collapse of the Mexican Peso: What Have We Learned?" Working Paper No. 5142. National Bureau of Economic Research: Cambridge, MA.

Salkin, J. S. March 2000. "Improving Monetary Management." Sigma One Corporation: Research Triangle Park, NC.

Sargent, T. J. and N. Wallace. 1986. "Some Unpleasant Monetarist Arithmetic." Chapter 5 in **Rational Expectations and Inflation** by Thomas J. Sargent. Harper and Row: New York.

Youngblood, C. E., C. K. Dordunoo, F. Larrain, S. D. Younger, and T. J. Grennes. January 1992. "Ghana: Macroeconomic Environment for Export Promotion." Prepared for USAID/Ghana, Contract No. CO-641-0000-C-00-1026. Sigma One Corporation: Research Triangle Park.

Youngblood, C. E. November 2000. "Instruments of Monetary Policy in Ghana." Paper prepared for USAID/Ghana.